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THESIS

NARDAC CIVILIAN DP TRAINING:
A NEED FOR MANAGEMENT ATTENTION

by

David J. Santoro

December 1982

Thesis Advisor: R. T. Harris

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This paper looks at the value of an in-house training program as a possible solution to these problems by showing why it may be an important source of intrinsic satisfaction to the employee. Attitudes in civilian industry are first discussed. A Naval ADP facility is examined for comparison purposes, its civilian employees surveyed to determine preceived effectiveness of the command's training program. The importance of adequately budgeting for training is established affirmatively.

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NARDAC Civilian DP Training: A Need for Management Attention

by

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Commander, United States Navy
B.S., United States Naval Academy, 1967

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION SYSTEMS

from the

NAVAL POSTGRADUATE SCHOOL
December 1982

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ABSTRACT

Much has been written within the past few years concerning ways to improve morale, productivity and retention of persons in the data processing profession. The computer industry has been particularly vulnerable to problems in these areas because of rapid growth in terms of size and technology. The result has been high turnover rates in its work force. The Navy employs a substantial number of civilian data processors in its ADP community and there is no reason to believe that the Naval ADP manager is immune to encountering the same problems.

This paper looks at the value of an in-house training program as a possible solution to these problems by showing why it may be an important source of intrinsic satisfaction to the employee. Attitudes in civilian industry are first discussed. A Naval ADP facility is examined for comparison purposes, its civilian employees surveyed to determine pre-ceived effectiveness of the command's training program. The importance of adequately budgeting for training is established affirmatively.

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I. INTRODUCTION

Many kinds of variables can influence the performance of people at work. These variables are generally divided into two classes - individual variables and situational variables. Individual variables include such personal traits as age and sex, education, experience, personality and the like. Situational variables are considered to be all other factors not inherently a part of the individual such as his working conditions, social environment, union relations, compensation, incentives, etc. The type and quality of training an individual receives is considered to be a situational variable. [1] Although personal development training programs generally have been limited to the executive, the rapidly expanding technological phenomenon of recent years that has permeated nearly every occupation, necessitates the desirability of such training for other groups as well.

The computer profession, now over thirty years old, may be facing a behavior problem that is a result of not having placed sufficient emphasis on a sound training program for its professional data processors. Within the computer industry, the relative importance of situational type variables is still a matter of debate among behavior scientists. It is an accpeted fact, however, that within the data processing field, technological changes have come fast and

furiously. Faced with a need to fill jobs in skill shortage areas, employers have the choice of "pirating" (and bidding up wages with inflationary effects), coping with poor fits of people to jobs (with negative effects on productivity), or providing job training. [2]

The situational variables the Navy faces in dealing with its civilian data processor population are assumed to be essentially the same as those in civilian industry. The manager in the Navy DP field is, however, constrained in certain ways his civilian counterpart is not. First, his budget is subject to close scrutiny by the Congress of the United States. Second, because his product directly or indirectly relates to the national defense, areas not concerned with immediate productivity often receive a lower priority. Third, because his employees are in fact government employees, he is limited by regulations regarding compensation and incentives such as promotions, pay raises, bonuses and awards.

With these factors in mind, it is the intent of this paper to examine civilian data processors in the Navy, specifically at a large Naval data processing facility, to see if a substantive relationship exists between resources invested in training and personnel's resultant attitude and job satisfaction.

Several questions are offered as an approach to this topic. First, is training on the job and related to the

data processing field a motivator for the professional data processor? Second, to what extent does the civilian data processing industry involve itself in ongoing training for its data processors and is there qualitative data to reflect involvement by size, budget, numbers of employees, etc., so that general comparisons can be made. Third, to what extent does a large Naval data processing facility invest resources in a training program and what is the data processor's perception of this training program? Chapter II will attempt to answer the first and second questions. Chapter IV will attempt to answer the third. Chapter III offers an overview of a Naval Data Automation Center and Chapter V puts forth some conclusions.

II. DATA PROCESSOR TRAINING - A LOOK THROUGH MUDDLED WATERS

A. DATA PROCESSOR

The term "data processor" is one of those unfortunate terms in the English language that if not specified, conjures up vastly different images to different people. On one hand a data processor is an inanimate machine performing data processing which is the preparation, storing, or manipulation of information or raw data by a computer. On the other hand a data processor is a person who performs functions related to data processing. In the context of this paper, a reference to a data processor (DPer for short) always refers to the latter definition unless otherwise specified. These include personnel who have anything to do with programming, all the way to the people who physically run and monitor the computers.

B. TRAINING NEEDS: PERSONAL DEVELOPMENT

It is important at this point to emphasize the type of training being addressed. Generally speaking, an organization may have a responsibility for the training of new employees, of providing additional training for employees to enhance their personal development. Each of these areas can be subdivided into smaller units, but it is the last-training for personnel development-that we are concerned with.

Training for personal development is generally directed toward providing learning experiences that will be useful to the individuals' effectiveness in their organization, thus being useful both for themselves and for their organization.

C. TRAINING NEEDS: TRAINING THE DPER AFTER HIRING

Folklore has come to picture DPers (particularly programmers) as a weird lot-unsociable and unmoved by social values others respect.

A fairly recent study indicates that this stereotype is at least partially based in fact. Having conducted interviews with over 2500 DP professionals, computer scientist J. Daniel Couger and behaviorist Robert A. Zawacki of the University of Colorado (Boulder) found that people who gravitate toward a DP career share a relatively high need for professional growth while demonstrating little need for social interaction. [3] *

Today's DPers understand the value of their labor, demand pleasant working environments, expect personal rights to be respected, and are less loyal to their employers than to their profession. Paul W. Abrahams of New York University contends that programmers have a great need for growth. In order to

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* Couger and Zawacki are authorities in the field of motivating and managing computer personnel. Their study will be addressed in some detail later in this section.

prevent losing good ones, management must train and move them through a variety of application areas. He says, "not only will they be more satisfied with their jobs, but the results will benefit from fresh viewpoints, and your project assignment may become more flexible as your staff develops a wider range of capabilities." [4]

Computer industry management in recent years has done some extensive self-analysis on the problems of declining productivity, the lack of qualified personnel (particularly programmers and systems analysts), and the high turnover rate among these skill workers. The turnover problem is particularly serious. One study revealed that 55 percent of the major companies surveyed lose at least 20 percent of their college educated systems analysts annually, while turnover for other college educated personnel was only 2 percent.[5] This is compounded by executive placement specialists who have disparagingly been dubbed "headhunters." According to Marshall Johnson, director of organizational management division of Prime Computer, Inc. of Farmingham, Mass., headhunters attract clients by convincing them that they are underpaid. The employees will leave their jobs paying the headhunters a commission. The headhunter will then turn to a corporation with a vacated position, perhaps one that he helped vacate, and try to refill. The cycle obviously inflates salaries. [6]

At a recent conference sponsored by California State Polytechnic University, an executive with a nationwide recruiting firm identified seven job related complaints that often breed discontent among computing employees and prompt them to take their services elsewhere.[7] These seven are:

- Limited opportunities to learn new skills and perform a variety of tasks.
- Desire for firsthand experience in new industry application areas.
- Obsolescence in an employer's facilities or procedures.
- Disappointment at being overlooked for promotion.
- Ill-defined, non-existent or severely limited career pattern.
- Frustration at being involved in overly ambitious development projects.
- Real or imagined inequalities in salary.

This introspection of an industry is all well and good but it is time to shift some of that focus from the problems to some possible solutions. One of these is so obvious that it is often overlooked: An aggressive ongoing training program. Such a program-well conceived, adequately budgeted and properly managed and executed-just might go a long way toward helping ADP departments attract and keep those quality people that seem so elusive.

An article in a recent edition of INFOSYSTEMS addressed the topic of ongoing training for computer specialists at

some length. It cited essentially three main reasons for pursuing a viable training program within an organization.[8]

First, according to the article, new people coming into the computer industry, even if armed with computer science degrees from prestigous universities, will soon find that they need specific, real world knowledge and skills that they did not pick up on campus.

Second, the article goes on, the rapid technological growth in the computer field is touching people it never touched before. Serge Beauregard, group vice-president of the renouned Deltak Inc., a leading publisher of computer enhanced multimedia training programs looks at it this way,

> If you were able to take a snapshot of today's labor force and economy, you would find that about five percent are engaged in a symbiotic relationship with computer technology. That is, they are supported in one way or another by an information technology system. If you look at trends in MIS technology, office automation, and industrial automation, it's fair to say that by 1990, 50 percent of the work force will be engaged in a relationship with information technology. There is an immense need to teach people not only how to use this technology, but how to exploit it and how to cope with the changes it will bring. [8]

A third reason for pursuing an ongoing training program, the article goes on, is, of course, the rapidly changing computer technology itself. New capabilities, enhancements and releases come at a fast and furious pace, resulting in a continuing need for training.

Couger and Zawacki, previously mentioned, have done extensive research in the field of DP motivation to find ways

to increase productivity and decrease employee turnover. In Chapter 2 of their book, Motivating and Managing Computer Personnel,[9] they describe in detail how existing theories of motivation can serve DP managers enhance the performance of their subordinates. They cite Frederick Herzberg's two-factor approach (dissatisfiers and satisfiers) showing that advancement and growth are recognized to be satisfiers, i.e. motivational factors. Extensive testing of DP professionals revealed that of all computer personnel, analysts and programmers showed the highest need for self-fulfillment and growth and that computer operators and data control personnel, although not as high as analysts and programmers, still displayed an above average need for self-fulfillment and growth when compared with the population in general.

Their study of over 2500 personnel in DP jobs was compared with the results of prior studies of personnel in other professions conducted by J. Richard Hackman (Yale University) and Greg R. Oldham (University of Illinois) using an instrument called the Job Diagnostic Survey. The Growth Need Strength, as they called it, was found to be very high, in fact the highest of all professions surveyed, for DP programmers and analysts. Computer operators and data control personnel, although not as high as programmers and analysts, fell in the upper one third of the professions surveyed which included sales, service, managerial, clerical, machine trades, bench work and structural work.[10]

This outcome is no surprise for DP managers use to demands by their staff that they be provided training, be allowed to attend conferences and seminars, etc. The key problem is that frequently DP professionals are working in jobs which are low in providing motivating potential to satisfy a high growth need. Research and expert opinion therefore, help one conclude that training while on the job, specifically directed towards providing professional and personal growth, can be an important motivator for today's data processor.

D. BSI'S SURVEY OF THE COMPUTER INDUSTRY [11]

Each year since 1976, Brandon Systems Institute, Inc. (BSI), a training consultant firm in Behtesda, MD, conducts a survey of DP training coordinators and managers who are responsible for DP training for their organizations. Although the survey helps them establish base line numbers for planning, budgeting, and staffing, an organization surveyed, once the results are returned, can use the survey to asses its standing among other DP organizations.

The survey questionnaire conducted in 1981 and the tabulated results with interpretation were provided gratis by BSI as an aid to this effort. The survey was sent to approximately 1350 data processing firms and 290 responses were received.

The survey is divided into three sections: about the DP trainer, about the training budget, and about the use of

training vendors. Although a complete presentation and analysis of the results of the survey is beyond the scope of this paper, the more important aspects will be discussed. Where information was provided concerning previous years, comparisons will be shown.

1. The Respondents

More than 75 percent of the personnel completing the survey identified themselves as training directors or coordinators. More significantly is that 75 percent of these personnel held full-time positions in the training director capacity. BSI notes that this is up almost 25 percent since 1979 indicating a possible greater recognition of DP training as a profession.

Almost half of the DP training directors reported salaries in excess of $30,000 annually. Although specific agencies were not identified, BSI reported that government salaries lagged substantially.

2. DP Department Size vs. Number of Trainers

In organizations where the total number of personnel in data processing positions was between 200-499 (comparable to the Naval facility surveyed), only five reported having no full time DP trainer employed, while ten reported having one full time trainer, and 53 reported having two or more.

3. Organization Training Data

This 1981 survey indicated that on the average, programmers and analysts received slightly more than 10.5

training days per year-down from 14.2 for programmers in 1978. BSI attributes this to two possible reasons. First, in very recent years programmers have already been trained in structured design techniques consequently reducing the training need. Second, many organizations suffer from a severe shortage of good programmers, which leads to managers refusing to release their people for additional training.

The number of training days for operators and data entry people indicated a serious deficiency-from 9.4 days per individual in 1978 to 5.0 days in 1981.

The primary methods by which DP trainers receive training information are direct mail and magazines and journals. Principal publications include Computerworld, Deltak newsletters, and Datamation. Many respondents felt that most publications have little direct relevance to DP training.

4. The Training Budget

Although not broken down by organizational size, the average percentage of total data processing budget devoted to training in 1981 was 1.2 percent, down from an industry wide average of 1.5 percent in 1978. The median amount of money spend on individual applications programmer training was $900 in 1981 but for operators and data entry individuals only $300. BSI comments, "It doesn't seem possible to provide meaningful training to anyone for $300-some people must be getting training while large numbers of others are not."

Of the respondents, 73 percent reported that when an organization cuts its budget, training is cut proportionately while 17 percent indicated that training would be either the first or second to go. It appears that overall, training is seen as a necessary function which is neither an easy target for the axe nor sacrosanct.

5. The Major Problems

The budget constraints for training, apparently felt industry wide, were surprisingly not identified as the most widespread problem. According to the BSE survey, first on the list was the matter of freeing the employee from work, possibly indicating that training receives a lower priority than production or that managers are paying "lip-service" to their training program.

BSI's survey may not be conclusive but its results are noteworthy of possible trends within the computer industry. BSI is a profit making organization in the business of providing DP training, however their surveys are considered to be reputable enough to have been referenced by articles in major computer periodicals. In order to get a more conclusive picture of what the climate of the organization is however, the perceptions of the employee must be examined as well, for factors more or less important than training may be influencing his attitudes.

III. THE NAVAL REGIONAL DATA AUTOMATION CENTER (NARDAC)

A. HISTORY

Prior to 1977, the Director, Information Systems Division (OP-91) attempted to centrally manage the Navy's non-tactical ADP program within the office of the Chief of Naval Operations.[12] The reputation that OP-91 enjoyed was somewhat less than even satisfactory in the performance of their functions. Congress, OMB, GSA, and GAO among others essentially viewed the Navy's ADP program as:

- o Being ineffective and inefficient;
- o Failing to meet development costs and target dates;
- o Failing to control ADP growth;
- o Not consolidating the multitude of ADP facilities; and
- o Generally inefficient and wasteful.

OP-91 was also assigned responsibility to provide ADP support for four different supervisors. According to a GAO study, this organizational arrangement was grossly ineffective. Due to demands for ADP support by each superior, OP-91 could not effectively provide the essentials of centralized management, equipment procurement guidance, and standardization of information systems. [13]

Since there existed an apparent lack of centralized direction, guidance, and leadership, individual commanders began to satisfy their own needs independent of the needs of

the other commands and without regard to the Navy's overall program mission objectives.

On 25 March 1976, the Vice Chief of Naval Operations, in response to the high level critisism the Navy's ADP program was drawing, tasked RADM J. W. Nance to conduct a staff study of "Navy Automatic Data Processing and Information System Management." It was recommended that the study group submit final recommendations to the CNO and the Secreatry of the Navy (Financial Management) with a target to establish a new command capable of strengthening the ADP management system within the Navy no later than 1 January 1977. [14]

As a result of this study, the Naval Data Automation Command (NAVDAC), was established in 1977 as an echelon-two shore activity under the command of the CNO. It was located at the Navy Yard in Washington, D.C.

Resolution of the aforementioned problems was attempted in part by chartering NAVDAC to control, directly, assigned field computer installations. NAVDAC, with the Director, Command, Control, and Information Systems Division (OP-942), would also review the overall Navy ADP program and defend its budget in the DOD review process.

A multitude of heretofore organizationally scattered Navy ADP commands were transferred in phases to the command of NAVDAC. Included were the five Data Processing Service Centers (DPSCs) located in Norfolk, Jacksonville, Pensacola, San Francisco, and San Diego. Under the re-organization

plan, they were renamed Naval Regional Data Automation Centers and exist now as well in Washington and New Orleans.

B. STRUCTURE, FUNCTION AND COMPOSITION

The following paragraphs relate to NARDACs in general, however, specific reference is made to NAVDAC, San Diego, when it is felt that a relationship exists with the data presented in the next chapter.

The NARDACs were established under the command of the Commander, Naval Data Automation Command (COMNAVDAC) as echelon three shore activities. Their mission is to provide automatic data processing services to Navy activities; to manage and direct remote facilities, as required, to provide local data processing support in coordination with the regional center; to design, develop, and maintain standard Navy automated systems; and perform such other functions as directed by higher authority. [15]

A typical command structure of a NARDAC is displayed in Figure 1.

All department heads in the organization are civilians as is the Technical Director. All are responsible to the Commanding Officer who typically is a line or supply corps officer of the rank of captain.

The departments vary widely from one another in composition of personnel. A brief description of each follows. [16]

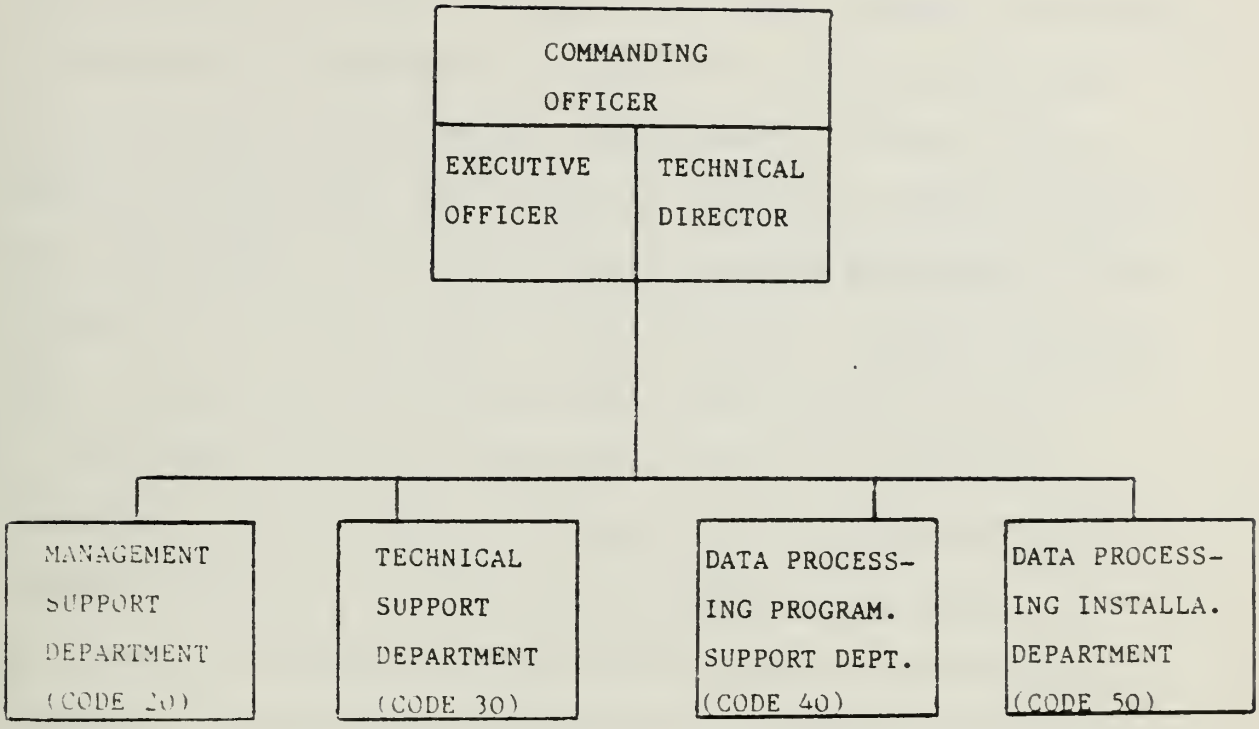
COMMANDING OFFICER
EXECUTIVE OFFICER
TECHNICAL DIRECTOR
MANAGEMENT SUPPORT DEPARTMENT (CODE 20)
TECHNICAL SUPPORT DEPARTMENT (CODE 30)
DATA PROCESS-ING PROGRAM. SUPPORT DEPT. (CODE 40)
DATA PROCESS-ING INSTALLA. DEPARTMENT (CODE 50)

Figure 1 Organization Structure of a NARDAC

1. Management Support Department, (Code 20), advises the Commanding Officer on matters dealing with management procedures and analysis, and on financial and budgetary dealing with management procedures and analysis, and on financial and budgetary matters. Additionally, it is responsible for personal and physical security and training coordination for civilian and military personnel. This department employs few, if any, DP professionals.

2. The Technical Support Department, (Code 30), plans, manages, and coordinates technical activities for the acquisition, implementation, distribution, maintenance,

and control of systems software. It also provides assistance as directed or requested in areas such as teleprocessing, software/systems performance measurement, software and or hardware acquisition and advanced technical planning support. DP professionals employed here are systems programmers with a good deal of experience in their field. General Schedule (GS) ratings for these individuals are typically 11-12.

3. The Data Processing Programming Support Department, (Code 40), is technically oriented into the analysis and documentation of automated data/information systems. Typical areas of responsibility include functional analysis of programs, systems design alternatives and the preparation of study reports or technical notes. Close liaison with the customer is required. Employed in this department are primarily the other very technically oriented DP professionals-the systems programmer analysts. Here, too, incumbents fill positions that are typically limited to the GS-11 GS-12 grades.

4. The Data Processing Installation Department, (Code 50), administers, operates and controls all ADP equipment including peripherals and their telecommunications devices. Operating three shifts (San Diego) and in a multi-processing environment, it is tasked to provide batch, teleprocessing, and remote job entry data processing services in support of designated commands and activities. It projects, schedules and controls operational workload and is responsible for

product quality assurance and customer liaison. Employed in this department is a mix of the DP professional. Responsible for acceptance, test and recovery, systems programmers are employed of GS grades 12-13. Seen also in this department are the employees at the other end of the DP spectrum-the computer operator. Supervisory incumbents in this field have GS ratings of 11-12 while most subordinates hold ratings of 8-9.

C. POSITION DESCRIPTIONS

Civil Service is the term commonly used to describe service performed for the Federal Government by employed civilians who have competitively attained their position and who may gain tenure by continuing satisfactory performance. The General Schedule employees are one of two main systems under which civil service positions are classified. NARDAC civilian employees belong to this system. After a person is hired into a GS position, satisfactory performance ratings result in increase in pay (but not grade) by steps (1 thru 10 for each grade) each year for steps 1 through 4, each 2 years for steps 5 through 7, and 3 years for steps 8 through 10. [17]

As has already been shown, the majority of the DP employees hold GS ratings of 8 or above. It has been the Federal Government's policy to classify positions in this range as requiring a technical profeciency, experience or higher

education of the incumbent. Whether it was necessary to have established the NARDACs with such high GS classifications is a matter of debate within the Navy's ADP community but this nevertheless reflects the intense competition for these professionals within the industry.

Typical first step starting salaries for a GS 8 and 9 as of this writing are $18,339 and $20,256 respectively and for a GS 11 and 12, $25,508 and $29,374 respectively. While these figures represent the actual gross pay of GS employees, they do not reflect the total cost to the government, which includes an added 10 percent-the government's average contribution for retirement, life insurance and health benefits. [18]

A unique feature of the NARDACs that separates them from the majority of other Naval facilities is that classification of positions is not done locally. Instead, the Consolidated Civilian Personnel Office (CCPO) in Washington performs this function for COMNAVDAC for all the NARDACs to ensure standardization across the board. Positions are not unlike those of non-Naval industrial organizations and are briefly summarized below. [19]

1. Systems Programmer - A systems programmer is a technical specialist in one or more components of systems software. He or she is involved in problem determination and capable of modifying utilities or installing changes to an operating system.

2. Systems Analyst - The systems analyst confers with users to define ADP projects, formulates statements of problems or objectives and defines solutions.

3. Systems Programmer/Analyst - The systems programmer/analyst confers with users to formulate a statement of objectives, design solutions and develop effective alternatives. They may work as a team on large projects or solo on small ones.

4. Computer Operator - The primary job of the computer operator is the actual running of the computer. Ancillary to this are the functions of mounting and dismounting magnetic tapes, monitoring and logging of processes and working with the scheduling staff. He is also very often the interface between systems/analyst personnel and the finished product consequently catching flack if there are job problems.

NARDACs employ primarily civilian personnel, ceiling points being assigned and centrally maintained by COMNAVDAC in Washington. The largest NARDAC is in Washington employing approximately 800 people, while San Diego, Norfolk, and Pensacola employ approximately 350 each, and Jacksonville, New Orleans, and San Francisco each employ approximately 190. Typical customers served by a NARDAC such as San Diego on a routine basis are type commanders of the air and surface forces, Naval Air Stations, Naval Stations, Personnel Support Activities, Naval Rework Facilities and Naval Test Centers. [20]

D. TRAINING

COMNAVDAC mandated by instruction that the NARDACs establish a Career Ladder Development Program for its ADP personnel and establish the procedures to administer the program. The intent was to create a situation which would deal with new employees as well as with individuals currently employed.

As a direct result of this mandate, a training proposal was drawn up and a plan implemented at NARDAC, San Diego which essentially puts the onus for progression through the training program on the individual and his supervisor. Called the generic Individual Development Plan (IDP), it consists of a series of category streams of DP courses. The supervisor and trainee select the sequence within each category and proceed at a pace compatible with the ability of the employee and work schedule. Modes of instruction include lecture, demonstration, computer assisted instruction, video and audio assisted instruction and self study programs. [21]

The obvious advantages of this arrangement are one, since the employees possess diverse experience, training plans can be individually tailored, and two, training can be conducted for minimumally sized groups thus causing the least impact on the production schedule.

IV. NARDAC ORGANIZATIONAL DIAGNOSIS

The upper level manager of a highly sophisticated, production oriented ADP facility today holds an exciting and challenging job albiet a job not without certain problems.

The same can be said of any industry, of course, but when talking about personnel and the unique characteristics of the professional data processor, already discussed, problems related thereto can be particularly demanding. The effective manager will keep his "ear to the ground" so to speak for indicators of potential trouble. If such indicators are evident, he will look for causes of their presence and then take action, so far as he is able, to remove them. Such a philosophy is not only condusive to a healthy organization but indicates care and respect for the individual employee as well.

The topic of this thesis came about as a result of the type of concern just described by the Commanding Officer and Technical Director of NARDAC San Diego. In recent months, in particular, they have been looking at ways of improving retention of data processors who are experienced in their field and have proven to be definite assets to the command. The loss of experienced personnel, for whatever reason, ultimately has an adverse impace on productivity. If the position remains vacant for a time, degradation of output

will occur in the form of a lesser amount or poorer quality. Once a replacement is found, a certain amount of time will lapse before the replacement is performing at a level of productivity expected of his billet. It is during this time that output of a particular unit may suffer the most because efforts by other unit members in bringing the replacement up to speed will very often be made at the expense of routine work resulting in the slippage of schedules.

The topic of the adequacy of training regarding civilian employees had not been arbitrarily selected. Shortly before discussions involving this thesis took place, a new training program proposal for the command had been written and was in the implementation stages. It was agreed upon that an introspective view of the organization was needed to see if training was, in fact, an important enough motivator to affect retention, morale and productivity of the organization to the extent of reshaping the budget in favor of or opposed to the training effort. Further, it was recommended and agreed upon that two techniques would be used to examine the training climate within the organization.

First, the Commanding Officer would respond to a questionnaire similar to the BSI questionnaire discussed in Chapter II, the objective being to see how his organization fared, relatively speaking, to the industry. Second, using an Organizational Development technique, the Commanding Officer would administer a survey-feedback instrument to DP personnel

to identify perceived strengths and weaknesses within the organization pertaining to training.

It is important to emphasize here that these two methods of data collection were meant for informative purposes only. Interpretation of the data will mean different things to different people. Final interpretation and corrective action, if any, rests in the hands of the Commanding Officer. Since NARDAC, San Diego was the only facility examined, it is a matter of conjecture whether the same results could be expected of the other six similar commands. This could perhaps be the topic of follow on research.

A. MANAGEMENT'S RESPONSE TO QUESTIONNAIRE

Interviews were conducted with and a questionnaire similar to the BSI survey administered to the Commanding Officer of NARDAC San Diego. Areas to be discussed are limited to those discussed in Chapter II as being the most relevant to the topic for comparison purposes.

1. The DP Training Director/Coordinator

Responses to questions in this area indicated that the individual serving in the capacity of Training Director/ Coordinator was a management analyst with DP training not assigned as a full time job. The position resides in the Management Support Department which does not contain DP billets as have been described. Nevertheless, responsibilities include maintaining a close liaison with other departments

in the development, coordination, and promulgation of a training policy for all civilian and military personnel. No one person was identified as serving in a full time training coordinator capacity.

2. DP Department Size

Approximately 304 civilians are employed at the NARDAC. Discounting a small number of military personnel assigned, approximately 250 civilians are involved directly in data processing applications. For comparison purposes, this size falls into the 200-499 range of BSI's survey.

3. Organization Training Data

Estimates of the average number of formal training days per year per individual, when compared with BSI's data, is quite low. For example, for systems analysts, applications programmers, and systems programmers, numbers of days are 1.6, 1.9 and 2.6 respectively. For computer operators and data entry personnel, 1/2 day per year per individual is estimated as being devoted to formal training.

It must be borne in mind that this does not include on-the-job training. Further, there is no way of knowing whether the respondents to BSI's survey considered OJT to be formal training.

The most frequent methods by which training information is received were identified as direct mail and magazines and journals. The AMA Catalog, COMPUTERWORLD, and DATAMATION were considered to be the most valuable.

4. The Training Budget

Compared to the entire data processing budget for 1981 (in excess of $15,000,000), about 1/2 of 1 percent was allocated for training. Of those personnel receiving formal training, applications programmers fared the highest approximating $800 per person while operators were allotted about $100 each.

Finally, it was indicated that in the event a budget cut were imposed, what formal training was budgeted for would be second to go after travel.

5. The Major Problem

Considering the apparent limited monetary resources available for training, it is surprising, as it was in BSI's survey, to find that this is not viewed as having the most detrimental effect on the training program. Considered at least as constraining were the problems of freeing the employee from work to attend classes and a lack of available experienced instructors.

Conclusions reached as a result of data generated by the questionnaire for management, when compared with the computer industry as a whole, lack the quality of being in touch with the person on the floor. Therefore, a true picture of the training climate cannot be seen without an input from te DPers themselves. For example, what appears to be a very small training budget may be compensated for in ways that can be shown through dialog with the employees.

Furthermore, employee satisfaction or dissatisfaction regarding training may not be the same across the department structure. This fact became apparent during discussions and interviews with various personnel.

It was recommended to the Commanding Officer that in order to solve these ambiguities, he administer a survey regarding the training program to DP personnel.

B. SURVEY OF NARDAC, SAN DIEGO DATA PROCESSORS

From time to time and for various reasons it becomes necessary for an organization to examine itself. It is necessary to find out from the people who work in the organization what they think if the analysis is going to be of value. The organizational diagnostic or organization effectiveness questionnaire is a survey-feedback instrument designed to collect data on organizational functioning by measuring the perceptions of persons to determine areas of activity that would benefit from an organizational development effort. It can be used as the sole data-collection technique or in conjunction with other techniques. [22]

The survey administered to NARDAC personnel was specifically designed to gain a feeling for the employee's perception of the DP training program as well as to see if perceptions were different among DP catagories.

An important assumption must be addressed here. Research seems to indicate that throughout the computer industry, the

systems analyst/programmer and systems programmer is placed on a different scale than his computer operator counterpart. This assumption being made, it was felt that a survey of the two groups, conducted separately, would provide a picture of the environment of higher resolution than on aggregating everybody. The survey was administered to each division separately within each department employing data processors. Forty-eight computer operators from the Data Processing Installation Department comprise one group and fifty-four programmers from the Technical Support and Data Processing Programming Support Department comprise the other. Consisting of twenty-one statements, most have a range of responses as follows:

1. very little.
2. a little.
3. to some extent.
4. to a moderate extent.
5. very great extent.

The number 3 is considered to be a neutral response. A few statements have as a first choice, "Never" or "Not at all" with six possible responses in these cases. Appendix A is the survey that was administered.

The survey addresses roughly three separate areas of the environment: first, the employee's general knowledge and perception of the training program; the employee's perception of the extent to which his job is providing for a growth

need; third, the employee's perception of how important training is to him. Tables I, II, and III present the tabulated results for analysts/programmers and operators for each of these three areas respectively. Appendices B and C are the resultant histograms with means and standard deviations by statement for each group.

TABLE I

Knowledge and Perception of Training Program
(Programmers & Analysts/Operators)

	A LITTLE OR BELOW	NEUTRAL	MODERATE OR ABOVE
Familiarity with training program	15/14	16/31	72/54
Training Budget	37/52	15/13	31/17
Inequitable training between departments*	16/6	7/10	24/33
Increasing my value as DP	44/38	24/23	31/40
Conflict of training and production skeds	61/29	35/29	4/42
Training facilities adequate	44/44	43/38	13/19
In-house expertise utilized effectively	54/44	37/29	9/21
Production suffers when new employee begins work	33/33	39/27	28/40

*The majority in each group indicated that they had no knowledge of the quality of training in other departments.

The first number indicates the percent of the sample size (54) of programmers and analysts; the second the percent of the sample size (48) of operators.

The most notable aspects presented in Table I are that significant numbers of employees in both groups feel that what in house expertise is available to conduct training is not being utilized effectively. Also, there is a concurrence between the groups as to the inadequacy of existing training facilities. This is similar to one of the most common gripes addressed in the Cal Poly study previously discussed. About one half of each group indicated that they did not know whether personnel in other departments were receiving better training. The rest of the responses to that statement were fairly split. This was rather surprising the expectation being that operators would have very strong positive feelings concerning this statement. It is also worth noting that a significant number in each group feel that the training program is not increasing their value as data processors.

What is surprising is that the two groups are split concerning their feelings about scheduling conflicts between production and training. The operators feel positively (concurring with what BSI found), while the programmers and analysts feel negatively. This may be a function of the job that permits the programmer to have a more flexible schedule.

TABLE II

Extent to Which Job Provides Growth Need
(Programmers & Analysts/Operators)

	A LITTLE OR BELOW	NEUTRAL	MODERATE OR ABOVE
Personal and professional growth	11/31	17/27	72/42
State of art techniques	44/58	28/25	24/17
Supervisor's concern for employee	33/25	11/33	56/42
Upper management's concern for employee	48/64	18/33	37/2
Valuable experience	17/14	15/46	68/40
Availability of DP journals and magazines	33/67	30/12	37/21
Have to hunt to find work	81/83	13/15	6/2

The first number indicates the percent of the sample size (54) of programmers and analysts; the second the percent of the sample size (48) of operators.

The data in Table II addresses growth needs provided by the job itself. While significant numbers in each group feel positively about the job providing for personal and professional growth, an almost equally significant number feel negatively about being kept abreast of state of the art techniques. Related to the studies of Couger and Zawacki

previously addressed, this could be a source of frustration and a dissatisfier that an effective training program could eliminate.

From a management standpoint it is interesting to see from the data that both groups feel strong support from their supervisors, at the same time feel a lack of support from upper level management.

TABLE III

How Important Training is to Individual
(Programmers & Analysts/Operators)

	A LITTLE OR BELOW	NEUTRAL	MODERATE OR ABOVE
Continuing DP education	4/10	11/15	85/75
Pursuing DP training in spare time	42/38	28/31	31/41
Formal training more valuable than OJT	28/17	44/50	26/33
Desire to cross train	22/11	33/13	44/75

The first number indicates the percent of the sample size (54) of programmers and analysts; the second the percent of the sample size (48) of operators.

The data presented in Table III may show to some extent how important ongoing training is personally to the individual. Two of the responses are strongly positive-the need for a continuing DP education and a desire to cross train. A significant number in each group indicate little interest in the pursuit of a continuing DP education in spare time.

It would be interesting to determine if this reflects the attitude of the DP population in general. In researching this topic, information was not found concerning a feeling one way or another.

Statement 13 which refers to how busy the employee is kept, in retrospect, shows no real significance to the study and has not been included in the tables. Statement 19 refering to one's feeling about how marketable his skills are also has not been included because the words "experience" and "training" are used and the results cannot be judged as being indicative of training alone on employment opportunities.

V. CONCLUSIONS AND RECOMMENDATIONS

There is enough evidence to support the contention that a training program is a motivator, especially to persons engaged in professions that are rapidly changing due to technological advances. This is particularly true in the data processing field where much of what was routine just half a decade ago is considered to be antiquated by today's state-of-the-art standards. If management is to seriously consider a viable training program in this field, a substantial investment is required. What may be professions may, if applied to data processing, be lacking. There are several indicators at NARDAC, San Diego, that point to this being the case.

The response to the statement concerning the value of the training program (question 9) does not show very positive attitudes. It is apparent that the job itself is perceived to be increasing their value as data processors. In this regard, however, the negative response to statement 6 seems to convey the feeling that they don't consider the job to be keeping them appraised of state-of-the-art techniques either.

It is not unexpected to find differences in perception between the groups as to where the training effort was being directed and that computer operators feel much more strongly about conflicts of production vs. training schedules than do

analysts and programmers. The groups are themselves split on how they feel about the adequacy of training facilities, but a significant percentage in each feel that they are inadequate.

Based upon the amount budgeted for training and where the training effort as reported is being directed, the survey results are not surprising and seem to concur with studies by BSI and others already discussed. Compared to industry wide figures as determined by BSI, the NARDAC's training budget certainly comes out on the very low end of the scale. The implications are that as a result of this, the employee's needs in this area are not being satisfactorily met especially regarding operator training.

Lets presume that nothing can immediately be done about increasing the training budget and look at some ways perceptions could at least be improved. For one thing, studies such as this could produce a Hawthorne type effect on the individual. In this regard it is important that management provide some sort of feedback to the employee even if to say that the study didn't tell us anything we already didn't know. The important thing is that once started, the dialog should be kept going particularly from upper level management. This is a basic premise of the survey-feedback approach. Both groups strongly felt that in-house expertise was not being utilized effectively in carrying out the training program. This seems like a relatively simple

matter to attack although those people who possess the expertise are probably the hardest to sacrifice from production work. It is important therefore, to establish a training schedule for all departments and stick to it so that everyone knows in advance what one's committments are and that priorities can be adjusted accordingly.

A facility of this size should have at least one billet whose title makes reference to command training if nothing else for shear visibility. Preferably, of course, there should be a full time training coordinator familiar with methods and courses who can apply the techniques in a cost effective manner. This, of course, gets into the budget aspects.

Assuming the previously addressed figure of one-half of one percent of a 15 million dollar budget is correct, this seems to be a pitifully small amount to be dedicating to the training effort. Undoubtedly much of this is allotted for travel for some and not others and consequently perceptions of inequity arise. It appears that an effort should be made to educate the powers that be on the importance of thinking of training as an investment and not an expense. In this regard, NARDAC, San Diego, certainly conforms with much of the computer industry. Until funds are made available that can be directed to upgrade the training effort and convince top management that training in the long run can be an investment, employee dissatisfaction will probably continue.

APPENDIX A

SURVEY QUESTIONNAIRE

1. I am familiar with the NARDAC, San Diego training program for data processors.

1. Not at all
2. Very little
3.
4.
5.
6. Very great extent

2. A continuing education in the data processing field aside from OJT is important to me.

1. Very little
2.
3.
4.
5. Very great extent

3. Regardless of the training program that exists at NARDAC, San Diego, I intend to pursue formal data processor training in my spare time away from work.

1. Very little
2.
3.
4.
5. Very great extent

4. My job has inherent opportunity for growth both personally and professionally.

1. Not at all
2. Very little
3.
4.
5.
6. Very great extent

5. I believe that formal and structured training is more valuable than on the job training.

1. Very little
2.
3.
4.
5. Very great extent

6. I feel that my job keeps me abreast of the latest state of the art data processing techniques.

1. Very little
2.
3.
4.
5. Very great extent

7. My boss sees my professional development as part of his job responsiblity.

1. Very little
2.
3.
4.
5. Very great extent

8. Upper level management at the NARDAC cares about my professional development.

1. Very little
2.
3.
4.
5. Very great extent

9. Training ignored, the job I do is increasing my value as a data processor.

1. Very little
2.
3.
4.
5. Very great extent

10. Ignoring my job, the training I am receiving at the NARDAC is increasing my value as a data processor.

1. Very little
2.
3.
4.
5. Very great extent

11. I have an awareness of how much money is budgeted for training in my department.

1. Not at all
2. Very little
3.
4.
5.
6. Very great extent

12. Based upon my experience, production suffers when a DP employee is hired who is not familiar with the functions of the NARDAC.

1. Very little
2.
3.
4.
5. Very great extent

13. I have little to do on my job and must hunt for work.

1. Never
2. Very seldom
3.
4.
5.
6. Very often

14. Written material is available (i.e. DP magazines, journals, etc.) at the NARDAC if I am interested in pursuing a DP matter either for personal or professional reasons.

1. Very little
2.
3.
4.
5. Very great extent

15. The training schedule as it now exists conflicts with the production schedule.

1. Very little
2.
3.
4.
5. Very great extent

16. Employees in other departments of the NARDAC are receiving better training than I am.

1. Don't know
2. Very little
3.
4.
5.
6. Very great extent

17. Day to day business as usual takes up most of my time as opposed to thinking about the future.

1. Very little
2.
3.
4.
5. Very great extent

18. Training facilities are adequate within the command.

1. Very little
2.
3.
4.
5. Very great extent

19. Because of the experience and training received here, I feel I could get an equal or better job elsewhere.

1. Very little
2.
3.
4.
5. Very great extent

20. Having the opportunity to cross train would be of importance to me.

1. Very little
2.
3.
4.
5. Very great extent

21. The NARDAC training program takes advantage of those personnel with technical expertise by utilizing them as instructors.

1. Very little
2.
3.
4.
5. Very great extent

APPENDIX B

SURVEY OF ANALYSTS AND PROGRAMMERS

QUESTION 1

ST.DEV. = 1.2787
MEAN = 3.92

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	5	*****
2.	3	***
3.	9	*********
4.	18	******************
5.	16	****************
6.	5	*****

QUESTION 2

ST.DEV. = 0.90286
MEAN = 4.26

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	1	*
2.	1	*
3.	6	******
4.	12	************
5.	34	**********************************

QUESTION 3

ST.DEV. = 1.3364
MEAN = 2.74

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	14	**************
2.	9	*********
3.	15	***************
4.	11	***********
5.	6	******

QUESTION 4

ST.DEV. = 1.1453
MEAN = 4.75

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	1	*
2.	2	**
3.	5	*****
4.	9	*********
5.	18	******************
6.	20	********************

QUESTION 5

ST.DEV. = 1.1378
MEAN = 2.88

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	9	*********
2.	6	******
3.	24	************************
4.	10	**********
5.	4	****

QUESTION 6

ST.DEV. = 1.2113
MEAN = 2.55

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	14	**************
2.	10	**********
3.	15	***************
4.	11	***********
5.	2	**

QUESTION 7

ST.DEV. = 1.3501
MEAN = 3.25

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	8	********
2.	10	**********
3.	7	*******
4.	20	********************
5.	10	**********

QUESTION 8

ST.DEV. = 1.5076
MEAN = 2.63

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	21	*********************
2.	5	*****
3.	9	*********
4.	13	*************
5.	7	*******

QUESTION 9

ST.DEV. = 1.2121
MEAN = 3.75

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	4	****
2.	5	*****
3.	8	********
4.	20	********************
5.	17	*****************

QUESTION 10

ST.DEV. = 1.4252
MEAN = 2.68

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	17	*****************
2.	7	*******
3.	13	*************
4.	10	**********
5.	7	*******

QUESTION 11

ST.DEV. = 1.7447
MEAN = 3.32

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	7	*******
2.	13	*************
3.	8	********
4.	9	*********
5.	9	*********
6.	8	********

QUESTION 12

ST.DEV. = 1.2584
MEAN = 2.96

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	8	********
2.	10	**********
3.	21	*********************
4.	6	******
5.	9	*********

QUESTION 13

ST.DEV. = 2.1431
MEAN = 2.16

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	20	********************
2.	15	***************
3.	9	*********
4.	7	*******
5.	2	**
6.	1	*

QUESTION 14

ST.DEV. = 1.2738
MEAN = 3.00

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	9	*********
2.	9	*********
3.	16	****************
4.	13	*************
5.	7	*******

QUESTION 15

ST.DEV. = 1.6716
MEAN = 2.76

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	9	*********
2.	13	*************
3.	11	***********
4.	19	*******************
5.	1	*
6.	1	*

QUESTION 16

ST.DEV. = 1.7698
MEAN = 4.66

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	6	******
2.	3	***
3.	4	****
4.	5	*****
5.	8	********
6.	28	****************************

QUESTION 17

ST.DEV. = 1.0333
MEAN = 3.62

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	2	**
2.	5	*****
3.	15	**********
4.	21	**********
5.	11	**********

QUESTION 18

ST.DEV. = 1.0989
MEAN = 2.33

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	19	**********
2.	5	*****
3.	23	**********
4.	7	*******

QUESTION 19

ST.DEV. = 1.2909
MEAN = 3.35

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	6	******
2.	8	********
3.	13	**********
4.	15	**********
5.	12	**********

QUESTION 20

ST.DEV. = 1.2689
MEAN = 3.44

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	4	****
2.	8	********
3.	18	**********
4.	8	********
5.	16	**********

QUESTION 21
sk

ST.DEV. = 1.1390
MEAN = 2.20

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	21	**********
2.	8	********
3.	20	**********
4.	3	***
5.	2	**

APPENDIX C

SURVEY OF COMPUTER OPERATORS

QUESTION 1

ST.DEV. = 1.0883
MEAN = 3.58

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	2	**
2.	5	*****
3.	15	**********
4.	15	**********
5.	11	**********

QUESTION 2

ST.DEV. = 1.1291
MEAN = 4.29

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	1	*
2.	4	****
3.	7	*******
4.	4	****
5.	32	********** **********

QUESTION 3

ST.DEV. = 1.4216
MEAN = 2.97

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	11	**********
2.	7	*******
3.	10	**********
4.	12	**********
5.	8	********

QUESTION 4

ST.DEV. = 1.4434
MEAN = 4.08

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	1	*
2.	9	*********
3.	5	*****
4.	13	**********
5.	10	**********
6.	10	**********

QUESTION 5

ST.DEV. = 1.1101
MEAN = 3.20

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	5	*****
2.	3	***
3.	24	************************
4.	9	*********
5.	7	*******

QUESTION 6

ST.DEV. = 1.2876
MEAN = 2.20

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	21	*********************
2.	7	*******
3.	12	************
4.	5	*****
5.	3	***

QUESTION 7

ST.DEV. = 1.3761
MEAN = 3.25

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	8	********
2.	4	****
3.	16	****************
4.	8	********
5.	12	************

QUESTION 8

ST.DEV. = 0.92157
MEAN = 1.95

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	20	********************
2.	11	***********
3.	16	****************
4.	1	*

QUESTION 9

ST.DEV. = 1.0139
MEAN = 3.31

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	3	***
2.	4	****
3.	22	**********
4.	13	**********
5.	6	******

QUESTION 10

ST.DEV. = 1.2949
MEAN = 2.93

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	8	********
2.	9	*********
3.	11	**********
4.	14	**********
5.	5	*****

QUESTION 11

ST.DEV. = 2.2105
MEAN = 2.20

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	15	**********
2.	20	**********
3.	6	******
4.	4	****
5.	1	*
6.	2	**

QUESTION 12

ST.DEV. = 1.2519
MEAN = 3.08

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	6	******
2.	10	**********
3.	13	**********
4.	12	**********
5.	7	*******

QUESTION 13

ST.DEV. = 2.0897
MEAN = 2.25

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	15	**********
2.	15	**********
3.	10	**********
4.	7	*******
5.	1	*
6.	0	

QUESTION 14

ST.DEV. = 1.2922
MEAN = 2.10

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	23	********** *******
2.	9	*********
3.	6	******
4.	8	********
5.	2	**

QUESTION 15

ST.DEV. = 1.5122
MEAN = 3.89

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	3	***
2.	9	*********
3.	2	**
4.	14	**********
5.	10	**********
6.	10	**********

QUESTION 16

ST.DEV. = 1.2275
MEAN = 5.06

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
2.	3	***
3.	5	*****
4.	1	*
5.	16	**********
6.	23	********** *******

QUESTION 17

ST.DEV. = 1.1101
MEAN = 2.79

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	7	*******
2.	10	**********
3.	21	*********************
4.	6	******
5.	4	****

QUESTION 18

ST.DEV. = 1.1107
MEAN = 2.52

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	12	************
2.	9	*********
3.	18	******************
4.	8	********
5.	1	*

QUESTION 19

ST.DEV. = 1.1697
MEAN = 3.25

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	3	***
2.	9	*********
3.	17	*****************
4.	9	*********
5.	9	*********

QUESTION 20

ST.DEV. = 1.1542
MEAN = 4.19

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	2	**
2.	3	***
3.	6	******
4.	9	*********
5.	27	***************************

QUESTION 21

ST.DEV. = 1.2489
MEAN = 2.48

MIDDLE OF INTERVAL	NUMBER OF OBSERVATIONS	
1.	16	**********
2.	5	*****
3.	14	**********
4.	11	**********
5.	1	*

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